References:

The Concept of a 'Standard Drink'

Banwell, C. (1999). How many standard drinks are there in a glass of wine? *Drug & Alcohol Review, 18*(1), 99-101. doi:10.1080/09595239996815
This small study investigates how much alcohol women consume when they have a glass of wine. Hotels in an inner city suburb of Melbourne were visited and their most commonly used wine glass was measured. Three major glass distributors and the Australian Hotels Association were asked about the size of commonly used wine glasses. Eighty-six women measured and recorded the amount of alcohol they drank in a 2-week prospective beverage diary. This study shows that, on average, wine glasses used in licensed premises such as hotels are larger than a standard drink. When at home participants, on average, drank more than a standard drink when consuming wine, champagne, spirits or liqueurs, but they drank less than a standard drink when drinking beer, cider and fortified wine. Wine drinkers, who are often women, cannot rely solely on counting their glasses of wine to keep them below the recommended number of standard drinks when in social situations, such as at hotels and private dwellings.

Bacon, S. D. (1962). The Rutgers Center of Alcohol Studies: A tentative conceptualization of purpose (notes and comment). *Quarterly Journal of Studies on Alcohol, 23*, 321-324.
Defines the basic purpose of the Center of Alcohol Studies as to develop greater understanding, both new insights and tested knowledge, about man and his society through the scientific study of alcohol and its use in beverages.

Boniface, S., Kneale, J., & Shelton, N. (2013). Actual and perceived units of alcohol in a self-defined 'usual glass' of alcoholic drinks in England. *Alcoholism: Clinical & Experimental Research, 37*(6), 978-983. doi:10.1111/acer.12046
Background: Several studies have found participants pour more than 1 standard drink or unit as their usual glass. This is the first study to measure actual and perceived amounts of alcohol in a self-defined usual glass of wines and spirits in the general population. Methods Participants were a convenience sample of adults who drink alcohol or who pour drinks for other people (n = 283, 54% women) at 6 sites in South East England. The survey was face to face and comprised a self-completion questionnaire and pouring task. Estimation accuracy, categorised as correct (±0.5 units), underestimate (>0.5 units), or overestimate (>0.5 units) was the main outcome.
Results: The mean number of units poured was 1.90 (SD 0.80; n = 264) for wine and 1.93 (SD 0.78; n = 201) for spirits. The amount of alcohol in a self-defined usual glass was estimated in 440 glasses (248 wine and 192 spirits). Overestimation took place in 42% glasses of spirit poured and 29% glasses of wine poured, and underestimation in 17 and 19%, respectively. Multinomial logistic regression found volume poured to be significantly associated with underestimating both wines and

spirits, and additionally for wine only, belonging to a non-white ethnic group and being unemployed or retired. Not having a university degree was significantly associated with overestimating both drink types.
Conclusions: This study is the first in the general population and did not identify systematic underestimation of the amount of alcohol in a self-defined usual glass. Underestimation is significantly associated with volume poured for both drink types; therefore, advocating pouring smaller glasses could reduce underestimation of alcohol consumption.

Brick, J. (2006). Standardization of alcohol calculations in research. *Alcoholism: Clinical and Experimental Research, 30*(8), 1276-1287. doi:10.1111/j.1530-0277.2006.00155.x
Background: Nonstandardized reporting of alcohol consumption, definitions of what constitutes a standard drink, and incomplete dosing or estimates of intoxication are common problems in many areas of alcohol research. To enhance communication among scientists and to make interpretation of results more accurate and meaningful, researchers need to apply systematically current scientific principles in calculating drinks, doses, and alcohol concentrations. Basic formulas are compiled and explained to assist alcohol researchers and standardize the reporting and interpretation of alcohol data. Methods: Basic alcohol calculations are reviewed, and 20 mathematical calculations in alcohol pharmacokinetics and pharmacology are derived. Examples of how each calculation works are presented. Results: The formulas presented enable researchers to calculate accurately and systematically the amount of alcohol in any beverage and estimate the blood alcohol concentration in a range of subjects with individual characteristics and drinking patterns. Conclusions: Accurate estimates of alcohol use and intoxication are important in many areas of research. Applying standards to the way alcohol is measured and interpreted enables better communication, more accurate analyses, and, in some cases, may impact the interpretation of results. Regardless of the field of study, alcohol researchers are encouraged to and can apply uniform standards in measuring alcohol consumption and estimating the effects of alcohol using the scientific methodologies described.

Cahalan, D., & Cisin, I. H. (1968). American drinking practices: Summary of findings from a national probability sample: II. Measurement of massed versus spaced drinking. *Quarterly Journal of Studies on Alcohol*, 29(3), 642-656.
The drinking practices of 2746 American adults, sampled according to national probabilities, are analyzed according to the V-V index (which takes into account massed vs. spaced practices) as opposed to the more common Q-F-V index. Different patterns emerge when a different index is used. Considerable tabulation is presented. (PsycINFO Database Record (c) 2012 APA, all rights reserved)

Candon, P., Ward, J., Pandina. R. (2014). The *Journal of Studies on Alcohol and Drugs* and the Rutgers Center of Alcohol Studies: A history of the evolution of alcohol research. Journal of Studies on Alcohol and Drugs, Supplement 17. (in press)
This article reviews the history of the *Journal of Studies on Alcohol and Drugs* as well as the Rutgers Center of Alcohol Studies. Each has its roots in the Yale

Laboratory of Applied Physiology and the era shortly after the repeal of National Prohibition in the United States. The journal was founded as the *Quarterly Journal of Studies on Alcohol* in 1940 by Howard W. Haggard, M.D., director of the Yale Laboratory of Physiology. Alcohol, although not originally the sole focus of the laboratory, eventually became the main and then only focus. Eventually a Section of Alcohol Studies and later Center of Alcohol Studies formally became components of the laboratory. The faculty grew to include notable figures such as Elvin Morton Jellinek and Mark Keller, among other influential people who helped establish a modern, multidisciplinary, scientific approach to alcohol problems in the United States. The first alcohol education program, originally called the Summer Session of the School of Alcohol Studies, was also founded there in 1943. The center later moved to Rutgers University in New Jersey, becoming the Rutgers Center of Alcohol Studies in 1962. With it came the summer school and the *Quarterly Journal of Studies on Alcohol,* which in 1975 became the *Journal of Studies on Alcohol.* The journal again changed names in 2007, becoming the *Journal of Studies on Alcohol and Drugs,* reflecting an increasing focus among substance use researchers on drugs other than alcohol. The article discusses the influence of the journal and center in the larger historical context of alcohol studies throughout the 20th century to the modern day.

Carruthers, S. J., & Binns, C. W. (1992). The standard drink and alcohol consumption. *Drug and Alcohol Review, 11*(4), 363-370.
The term 'standard drink' is commonly used when researchers collect alcohol consumption data and when educators create campaigns to encourage people to drink responsibly. However, little is known about community knowledge of the term 'standard drink' or what it represents in terms of what people are drinking in their own homes or on unlicensed premises. This study measured the amounts of a variety of alcoholic beverages that a sample of Perth metropolitan people use when drinking on unlicensed premises. The level of knowledge of the alcohol content of a variety of beverages and the knowledge of the term standard drink and what it represents in terms of commonly consumed beverages was also measured. The results showed that knowledge of the alcohol content of beverages was very poor. Knowledge of the term standard drink and what it represents in terms of absolute alcohol was also poor. Regarding the amounts of beverages poured, red and white wine, champagne and spirits are likely to be poured in amounts well in excess of a standard drink when people are drinking in their own homes. The results of this study have implications for the efficacy of educational campaigns designed to encourage safe and responsible drinking practices through the monitoring of personal intake. Before these can be effective, the terminology used must be familiar and well understood by the community towards which they are aimed. T Rutgers Center of Alcohol Studies
he results also discussed with respect to the design and administration of alcohol consumption questionnaires.

Cook, P. J. (2001). Tax laws and alcohol. *Encyclopedia of Drugs, Alcohol & Addictive Behavior*. Ed. Rosalyn Carson-DeWitt. 2nd ed. Vol. 3. New York: Macmillan Reference USA, 2001. 1073-1076. *Gale Virtual Reference Library*. Web. 11 Oct.

2013.
http://go.galegroup.com/ps/i.do?id=GALE%7CCX3403100438&v=2.1&u=new67449&it=r&p=GVRL&sw=w&asid=f5fb9025ef39eb0c1585afc20c063159
Another debated issue is that of uniform taxation. A can of beer, a glass of wine, and a shot of spirits all contain approximately the same amount of ethanol, but are taxed quite differently; the federal excise tax on a shot of spirits exceeds the tax on a can of beer by a factor of 2, and on a glass of wine by a factor of 3. If special taxes on alcoholic beverages are ultimately justified by the fact that such beverages are intoxicating, then these disparities are difficult to explain. Part of the explanation may be the widespread belief that spirits are in some sense more intoxicating than beer or wine, and hence more subject to abuse, whereas beer is the "drink of moderation" and wine "the drink of connoisseurs." But much of the evidence works against this view. Indeed, beer consumption may be more costly to society (per drink) than spirits because of the demographics of beverage choice: young men, a group that consumes most of their ethanol in the form of beer, has by far the highest incidence of alcohol-related traffic accidents and violent crimes.

Cook, P. J., & Durrance, C. P. (2013). The virtuous tax: Lifesaving and crime-prevention effects of the 1991 federal alcohol-tax increase. *Journal of Health Economics, 32*(1), 261-267. doi: http://dx.doi.org/10.1016/j.jhealeco.2012.11.003
The last time that federal excise taxes on alcoholic beverages were increased was 1991. The changes were larger than the typical state-level changes that have been used to study price effects, but the consequences have not been assessed due to the lack of a control group. Here we develop and implement a novel method for utilizing interstate heterogeneity to estimate the aggregate effects of a federal tax increase on rates of injury fatality and crime. We provide evidence that the relative importance of alcohol in violence and injury rates is directly related to per capita consumption, and build on that finding to generate estimates. A conservative estimate is that the federal tax (which increased alcohol prices by 6% initially) reduced injury deaths by 4.5% (6480 deaths), in 1991, and had a still larger effect on violent crime.

Cook, P. J., & Moore, M. J. (1994). This tax's for you: The case for higher beer taxes. *National Tax Journal, 47*(3), 559-573.
This paper examines the influence of alcoholic beverage prices on the prevalence and social costs of alcohol abuse in the U.S. The paper focuses on the youth since it is a group that is most prone to abusing alcohol and that suffers a disproportionate share of the adverse consequences of abuse. Since most youthful alcohol consumption is in the form of beer, the paper's particular concern is to document the effects of raising the federal and state beer excise taxes. The paper further describes the excise tax structure and reviews the normative standards by which to judge the appropriate magnitudes for such taxes. A central issue is the extent to which higher alcohol prices will curtail abuse and its costly consequences.

Cook, P. J., & Tauchen, G. (1982). The effect of liquor taxes on heavy drinking. *The Bell Journal of Economics*, 379-390.
The authors present evidence that chronic heavy drinkers' consumption is responsive

to changes in the price of liquor. They estimate that an increase in the lliquor excisetax by one dollar (1967 prices) per proof gallon reduces the liver cirrhosis mortality rate by 5.4% in the short run, and perhaps twice that amount in the long run.

Cooper, D. B. (1999). What is a 'standard drink'? ICAP report 5. *Journal of Substance Use, 4*(2), 67-69.

BACKGROUND
The practice of standardizing drinks has long been implemented in commercial settings in which alcohol is available. Drink measures poured in licensed premises are used to standardize the volume of a given beverage sold to patrons and are controlled by licensing authorities. Commercial measures of most forms of beverage alcohol often vary from one country to another and are largely shaped by drinking customs. In many European countries, for example, wine is served in decilitre increments, and the British pint and half-pint are the staple servings of draught beer in pubs. Serving sizes of spirits are also often standardized in most industrialized countries.
CONCLUSIONS
As this report has attempted to illustrate, the way in which the concept of a standard drink is currently implemented within an international setting is less than optimal. For the purposes of research and for cross-cultural comparisons, the usefulness of the 'standard drink' hinges upon international consensus on the way in which it is defined. The challenge is to establish acceptable criteria for standardizing units of measurement and to strive towards greater harmonization in the way in which the concept of a standard disk is used. It has been suggested

Dawson, D. A., & Grant, B. F. (2011). The "gray area" of consumption between moderate and risk drinking. *Journal of Studies on Alcohol & Drugs, 72*(3), 453-458.
Objective:: The objective of this study was to see whether levels of alcohol consumption newly included as "moderate" in proposed changes to the 2010 Dietary Guidelines for Americans are associated with significant levels of alcohol-related harm.
Method: Using longitudinal data from a nationally representative sample of U.S. adults (N = 26,438; 51.8% female), we compared relative risks and population attributable fractions for nine measures of concurrent and eight measures of prospective alcohol-related harm among three groups of drinkers: those whose consumption lay within the old 2005 Dietary Guidelines for Americans guidelines for moderate drinking, those in the "gray area" of consumption between the 2005 and proposed 2010 Dietary Guidelines for Americans, and those who exceeded the proposed 2010 Dietary Guidelines for Americans.
Results: The gray area of consumption was associated with small but significantly increased risks of prevalent and incident alcohol dependence, incident alcohol-related interpersonal problems, and prevalent job loss. There were no associations with medical conditions or mental disorders. Although the harms associated with this level of consumption reflected low absolute and/or relative risks of harm, their

impact was not negligible because of the large proportion of drinkers in the gray area of consumption (29.1%). The overwhelming majority of incident harm among baseline gray area drinkers was associated with consumption that had increased over the follow-up interval to exceed the proposed 2010 Dietary Guidelines for Americans.
Conclusions: We recommend two alternative approaches to rewording the proposed changes to the 2010 Dietary Guidelines for Americans that would avoid suggesting that there are benefits associated with the gray area of alcohol consumption.

De Visser, R.,O., & Birch, J. D. (2012). My cup runneth over: Young people's lack of knowledge of low-risk drinking guidelines. *Drug & Alcohol Review, 31*(2), 206-212.
Introduction and Aims: If young people are to consume alcohol in accordance with government guidelines, they must possess the relevant knowledge and skills. No previous research has examined correlations between different forms of knowledge of alcohol guidelines or how they are related to personality variables and beliefs. Design and Methods: Two samples were recruited in South-East England: 309 secondary school students aged 16-18, and 125 university students aged 18-25. All participants completed a computer-administered survey of knowledge and beliefs. University students also reported their alcohol consumption and completed tasks in which they poured their 'usual' drinks, and what they believed to be 'units' of alcohol. Results: Most respondents lacked the knowledge and skills required to drink in accordance with government guidelines. Participants' usual drinks were substantially larger than one unit, and participants tended to underestimate the unit content of drinks. There was little evidence that possession of accurate knowledge of one aspect of alcohol units and guidelines was related to accurate knowledge in other domains.
Discussion and Conclusions: Many young people may lack the knowledge required to monitor their alcohol consumption or give accurate self-reports in research. Future research should evaluate using a drink-pouring task as part of interventions designed to improve knowledge and skills and encourage moderate consumption of alcohol.

Devos-Comby, L., & Lange, J. E. (2008). "My drink is larger than yours"? A literature review of self-defined drink sizes and standard drinks. *Current Drug Abuse Reviews, 1*(2), 162-176.
National health offices define drink sizes to establish guidelines for alcohol use. International variations exist in the limits and drink sizes recommended. Surveys assessing drinking levels rely on the notion of standard drink when enquiring about participants' alcohol consumption and international comparisons are difficult because of the various definitions of one standard drink. Surveys are based on the assumption that respondents know and understand the concept of standard drink and are able to use it. We reviewed studies examining participants' knowledge and understanding of the notion of standard drinks as well as their ability to pour standard drinks. Across studies, participants' drink sizes typically contained greater volumes of alcohol than one standard drink. This suggests that levels of alcohol consumption have been underestimated in previous research. The magnitude of this over-sizing effect varied based on types of drinks, vessel sizes, drinking habits, and research methods. Indeed, the effect was the greatest for mixed drinks and spirits, followed by wine and beer. It

also increased with vessel size and was affected by respondents' drinking experience. Using photographs of vessels as representations of usual drinks exhibited the strongest discrepancy compared to tasks using actual vessels; and paradigms involving pouring real alcohol seemed to lead to greater effects than those using water or colored water. Lastly, evidence suggests that these misperceptions could be corrected and that such correction may reduce drink sizes. Implications of these findings are discussed and recommendations for researchers, health promotion campaigns and policy makers are made.

DiLoreto, J. T., Siegel, M., Hinchey, D., Valerio, H., Kinzel, K., Lee, S., . . . DeJong, W. (2012). Assessment of the average price and ethanol content of alcoholic beverages by brand- United States, 2011. *Alcoholism: Clinical & Experimental Research, 36*(7), 1288-1297. doi:10.1111/j.1530-0277.2011.01721.x
Background: There are no existing data on alcoholic beverage prices and ethanol (EtOH) content at the level of alcohol brand. A comprehensive understanding of alcohol prices and EtOH content at the brand level is essential for the development of effective public policy to reduce alcohol use among underage youth. The purpose of this study was to comprehensively assess alcoholic beverage prices and EtOH content at the brand level. Methods: Using online alcohol price data from 15 control states and 164 online alcohol stores, we estimated the average alcohol price and percent alcohol by volume for 900 brands of alcohol, across 17 different alcoholic beverage types, in the United States in 2011.
Results: There is considerable variation in both brand-specific alcohol prices and EtOH content within most alcoholic beverage types. For many types of alcohol, the within-category variation between brands exceeds the variation in average price and EtOH content among the several alcoholic beverage types. Despite differences in average prices between alcoholic beverage types, in 12 of the 16 alcoholic beverage types, customers can purchase at least 1 brand of alcohol that is under $1 per ounce of EtOH. Conclusions: Relying on data or assumptions about alcohol prices and EtOH content at the level of alcoholic beverage type is insufficient for understanding and influencing youth drinking behavior. Surveillance of alcohol prices and EtOH content at the brand level should become a standard part of alcohol research.

Elder, R. W., Lawrence, B., Ferguson, A., Naimi, T. S., Brewer, R. D., Chattopadhyay, S. K., Toomey, T.L., & Fielding, J. E. (2010). The effectiveness of tax policy interventions for reducing excessive alcohol consumption and related harms. American Journal of Preventive Medicine, 38(2), 217-229.
A systematic review of the literature to assess the effectiveness of alcohol tax policy interventions for reducing excessive alcohol consumption and related harms was conducted for the Guide to Community Preventive Services (Community Guide). Seventy-two papers or technical reports, which were published prior to July 2005, met specified quality criteria, and included evaluation outcomes relevant to public health (e.g., binge drinking, alcohol-related crash fatalities), were included in the final review. Nearly all studies, including those with different study designs, found that there was an inverse relationship between the tax or price of alcohol and indices

of excessive drinking or alcohol-related health outcomes. Among studies restricted to underage populations, most found that increased taxes were also significantly associated with reduced consumption and alcohol-related harms. According to Community Guide rules of evidence, these results constitute strong evidence that raising alcohol excise taxes is an effective strategy for reducing excessive alcohol consumption and related harms. The impact of a potential tax increase is expected to be proportional to its magnitude and to be modified by such factors as disposable income and the demand elasticity for alcohol among various population groups.

Flegal, K. M. (1991). Agreement between two dietary methods in reported intake of beer, wine and liquor. *Journal of Studies on Alcohol, 52*(2), 174.
This study compares reported beer, wine and liquor intake from a dietary quantity-frequency questionnaire and a 16-day diet diary kept by the same respondents in the 1984-85 University of Michigan Food Frequency Study. The study subjects were 228 black and white men and women, aged 24-51 years. On the two methods, the reported mean ethanol intake derived from each beverage, mean frequency of intake of each beverage and mean quantity for each beverage were similar. The relative rankings of individuals by the amount of ethanol for each beverage were also similar. The methods agreed less well on whether a particular beverage was ever consumed. The absolute amount of ethanol from each beverage agreed more closely between methods than did the percent of ethanol from each beverage. Results were similar for each race-sex subgroup. These findings suggest that analyses should use the reported amount of ethanol from each beverage, rather than converting to percentages or classifying according to the most used beverage. The good general agreement in the types and amounts of alcoholic beverages reported promotes some confidence in the relative validity of data from these two dietary methods for describing moderate alcohol intake in the general population.

Geller, E. S., Russ, N. W., & Altomari, M. G. (1986). Naturalistic observations of beer drinking among college students. *Journal of Applied Behavior Analysis, 19*(4), 391-396.
We observed the beer drinking behavior of 308 university students in several bar and party settings. The following relationships were found: males drinking beer in bars consumed 0.92 oz per min; females drank less beer than males, and stayed in a bar for a longer time period; patrons drank significantly more beer when drinking in groups and when purchasing beer in pitchers versus cups or bottles; and intervals between party arrival and first drink and between party departure and last drink varied inversely with blood alcohol concentration. We discuss these findings with regard to developing interventions to prevent alcohol-impaired driving.

Gill, J. S., & Donaghy, M. (2004). Variation in the alcohol content of a 'drink'of wine and spirit poured by a sample of the Scottish population. *Health Education Research, 19*(5), 485-491.
The standard UK alcohol unit is used to record alcohol consumption and, in health promotion, as a useful yardstick by which the public may be encouraged to monitor

their own drinking levels. To investigate the correspondence between this standard unit and the actual amount contained in the 'usual' drink poured by a sample of the Scottish public, participants (n = 251) were recruited from three employers in a major city—a manufacturer, an academic and a financial institution. Following a brief questionnaire, participants were asked to pour their usual drink of wine, and then spirit, into a glass. Among drinkers (n = 238), the mean amount of alcohol in a drink of wine corresponded to not 1, but 1.92 UK units. For spirit, the corresponding figure was 2.3 UK units. For wine, 43% of the sample poured more than 2 units, for spirit, 55%. (Males poured significantly more spirit than females.) These findings may have important implications for individuals who wish to promote and to adopt sensible drinking practices when consuming wine and spirit at home. Also, the reliability of many consumption surveys, where there is often the implicit assumption that a 'drink' is equivalent to a 'standard unit', must be questioned.

Grønbæk, M., & Heitmann, B. (1996). Validity of self-reported intakes of wine, beer and spirits in population studies. *European Journal of Clinical Nutrition, 50*(7), 487-490.
Objective: To compare data on intake of wine, beer and spirits from a frequency questionnaire with intake of each type of alcoholic beverage estimated from a dietary interview.
Design: Cross-sectional study.
Setting: The Danish MONICA study.
Subjects: A randomly selected sub-sample of 244 women and 249 men aged 35-65.
Main Outcome Measure: Differences in intake of beer, wine and spirits as reported by the frequency questionnaire and the diet history interview.
Results: There was an overall agreement between the two methods, with very little or no systematic variation for all three alcoholic beverages.
Conclusion: Compared to a more time consuming and thorough dietary interview, the traditional frequency questionnaires seem to sufficiently capture intakes of different types of alcohol. Bias in alcohol reporting by the frequency questionnaire does not seem responsible for the recently found decreased mortality among subjects with a daily intake of wine, nor the increased mortality from spirits drinking.

Gual, A., Martos, A. R., Lligoña, A., & Llopis, J. J. (1999). Does the concept of a standard drink apply to viticultural societies? *Alcohol and Alcoholism, 34*(2), 153-160. doi:10.1093/alcalc/34.2.153
The use of standard drink units (SDUs) in the measurement of individual alcohol consumption has become widely popular in recent years. However, the ethanol content of drinks varies from country to country and is usually arrived at without scientific backing. The present study was designed to establish an SDU for a predominantly wine-drinking country (Spain). Two field studies were simultaneously conducted to gather data about home and public alcohol consumption in eight regions of the country with a total of 10751 subjects. The average alcohol content of a drink was very similar for wine and beer, whereas in the case of spirits it was almost double. Relevant differences were found across regions, drinking settings and city sizes. A Spanish SDU was set at 10 g of ethanol for wine and beer, with a measure of spirits accounting for two SDUs. The use of SDUs should be encouraged

in primary health care settings. However, dispersion of data suggests that, when SDU is used as a screening tool, additional information should always be obtained in borderline cases.

Harding, R., & Stockley, C. S. (2007). Communicating through government agencies. *Annals of Epidemiology, 17*(5, Supplement), S98-S102.
A comparison of worldwide recommendations on alcohol consumption reveals wide disparity among countries. This could imply that many of the recommendations do not adequately accommodate the science, given that the science is equally valid worldwide. Such a view, however, would be an oversimplification of the problem that those who formulate such guidelines face. The objective of guidelines is to influence and change behavior among target populations. It follows, therefore, that several factors then become relevant: behavior that is thought to be in need of change, the culture and mindset of the target populations, and the kind of message that is likely to be effective. There are some tensions between advice intended only to reduce the prevalence of misuse and that which also seeks to reflect the evidence on the beneficial health effects of moderate consumption.

Hawks, D. (1999). Not much to ask for, really! The introduction of standard drink labelling in Australia. *Addiction, 94*(6), 801-811. doi:10.1080/09652149933270
An account is provided of the processes leading up to the introduction of standard drink labelling on all alcoholic beverage containers in Australia. The roles of research and advocacy in recommending the introduction of such labelling are analysed as is the resistance of some parts of the alcohol beverage industry. It is concluded that the success of this policy initiative derived from the carefully orchestrated campaign in which researchers co-operated with health advocates. The prior existence of nationally endorsed guidelines for safe drinking expressed in terms of standard drinks, recommendations of the National Health Policy on Alcohol and an accumulation of relevant research were crucial elements for success. However, the role played by some fortuitous circumstances cannot be ruled out.

Henderson, Y. (1934). *A new deal in liquor, a plea for dilution.* Doubleday, Doran & Company, Inc. In a historical context, alcohol consumption was viewed from a toxicology angle first, and beer was not considered intoxicating. Henderson, who was a toxicologist, argued that alcohol is a poison and problematic only above a threshold.

Holford, N. H. (1987). Clinical pharmacology of ethanol. *Clinical Pharmacokinetics, 13*(5), 273-292.
The pharmacokinetics of ethanol after typical doses are described by a 1-compartment model with concentration-dependent elimination. The volume of distribution estimated from blood concentrations is about 37 L/70 kg. Protein binding of ethanol has not been reported. Elimination is principally by metabolism in the liver with small amounts excreted in the breath (0.7%), urine (0.3%), and sweat (0.1%). Metabolism occurs, principally by alcohol dehydrogenase, in the liver to acetaldehyde. Models of ethanol input and absorption are crucial to the description

and understanding of the effects of ethanol dose on bioavailability. Little attention has been paid to evaluation of potential models. First-pass extraction of ethanol is predicted to be dependent on hepatic blood flow and ethanol absorption rate, with a typical extraction ratio of 0.2. The overall elimination process can be described by a capacity-limited model similar to the Michaelis-Menten model for enzyme kinetics. The maximum rate of elimination of ethanol (elimination capacity or Vmax is 8.5 g/h/70 kg. This would be equivalent to a blood ethanol disappearance rate of 230 mg/L/h if metabolism took place at its maximum rate. The elimination rate is half of the elimination capacity at a peripheral blood ethanol concentration (Km) of about 80 mg/L. Ethanol is readily detectable in expired air. The usual blood:expired air ratio is 2300:1 and breath clearance at rest is 0.16 L/h. The renal clearance of ethanol is 0.06 L/h and sweat clearance is 0.02 L/h. The use of a zero-order model of ethanol elimination has been widespread although the limitations of this model have been known for a long time. Much of the published work on ethanol pharmacokinetics must be regarded with suspicion because of this assumption.

Jellinek, E. M. (1947). Recent trends in alcoholism and in alcohol consumption. *Quarterly Journal of Studies on Alcohol, 8*(1), 1-42.
One of the first scientific analyses of consumption of alcoholic beverages with data shown separately for distilled spirits, wine, beer, and the total alcohol contained in the three types. The average alcohol content of the distilled spirits is defined as 45%, of wines, 17%, and of beer, 4%. In a footnote: the alcohol content of beer is always stated in terms of weight and of other beverages in terms of volume, In order to have a common denominator the alcohol content of beer is give in this study in terms of volume. Thus, 3.2 per cent by weight equals 4 per cent by volume.

Jellinek, E. M. (1952). Phases of alcohol addiction. *Quarterly Journal of Studies on Alcohol, 13*(4), 673.
One of Jellinek's most notable scientific contributions is the description of the alcoholism syndrome published in full, based on his previous articles and presentation at the Yale Summer School of Alcohol Studies, and resulting, eventually in his seminal book, *The disease concept of alcoholism* in 1962.

Jones, A. W. (1991). Concentration-time profiles of ethanol in capillary blood after ingestion of beer. *Journal - Forensic Science Society*, 31(4), 429-439.
Blood ethanol profiles were determined in experiments with healthy volunteers after they had drunk beer. When 330 ml of light beer (1.8% w/v ethanol) was consumed in 5 min by four men and four women, the average peak blood-alcohol concentration (BAC) reached was 8 mg/100 ml (range 2-11). After nine men had drunk 660 ml of beer (3.0% w/v or 3.6% w/v ethanol) in 25 minutes on an empty stomach, the average peak BAC was 32 mg/100 ml (range 26-44) and 37 mg/100 ml (range 23-54) respectively. When the same two beers were consumed by another nine men together with a meal, the peak BAC was 24 mg/100 ml (range 20-29) and 28 mg/100 ml (range 20-39) respectively. The peak BAC occurred earlier when beer was ingested together with food; mean 32 min (range 30-50) compared with 41 min (range 30-70) with an empty stomach. The rate of disappearance of alcohol from

blood (beta-slope) was 12 mg/100 ml/h in the fed state and 15 mg/100 ml/h when subjects were fasted. The apparent volume of distribution of ethanol (Vd) was 0.65 l/kg (SD 0.07) for the empty stomach condition but exceeded unity when beer was ingested together with food. It seems that part of the dose of alcohol when consumed with food never reaches the systemic circulation.

Jones, A. W. (1993). Disappearance rate of ethanol from the blood of human subjects: Implications in forensic toxicology. *Journal of Forensic Sciences, 38*(1), 104-118. This article outlines major developments in knowledge about the human metabolism of ethanol. The results of a large number of controlled experiments aimed at measuring the rate of ethanol elimination from the blood are reported. The factors that influence the rate of ethanol elimination from blood, such as the amount of ethanol ingested, the drinking habits of the subjects, and the effect of food taken together with, or before, drinking were investigated. The slowest rate of ethanol disappearance was observed in a healthy male subject who ingested 0.68 g ethanol/kg body weight after an overnight (8 h) fast; the beta-slope was 9 mg/dL/h. The fastest rate of ethanol disappearance was observed in a male chronic alcoholic during detoxification; the beta-slope was 36 mg/dL/h. This four-fold difference in the rate of ethanol disposal should be considered when the pharmacokinetics of ethanol become an issue in drinking and driving trials, for example, when retrograde estimations are attempted.

Jones, A. W. (2000). Measuring alcohol in blood and breath for forensic purposes: A historical review. *Forensic Science Review, 12*(1/2), 151-182.
This review concerns important events and trends in the evolution of chemical tests for alcohol intoxication on two continents; Europe and North America. In particular, the pioneer workers in this field and their major contributions to forensic alcohol analysis are emphasized. Quantitative methods for the determination of alcohol in blood, breath, and urine appeared early in the twentieth century and experimental alcohol research had already started in several European countries. The first statutory limits of blood-alcohol concentration (BAC) were introduced in Norway and Sweden during the 1930–1940s where Widmark's micro-diffusion method was approved for forensic purposes. Between 1931–1935 in the U.S., the first instrument (the Drunkometer) was developed for measuring the concentration of alcohol in a person's breath to supplement various clinical signs and symptoms of drunkenness. The breath-alcohol concentration (BrAC) was always translated into the presumed coexisting BAC to furnish corroborative or presumptive evidence of impairment at the wheel. After the Breathalyzer device was developed by Borkenstein around 1953–54, breath-alcohol testing became firmly established for law enforcement purposes in the U.S. and Canada. The classic wet-chemistry methods of blood-alcohol analysis were displaced by enzymatic procedures in the early 1950s and in the 1960s gas chromatographic (GC) methods dominated. Today, headspace GC is the mainstay in forensic science laboratories for the determination of alcohol and other volatile substances in body fluids. The first breath-alcohol devices used in Europe were relatively simple screening tests for alcohol at the roadside and positive results were always followed-up by quantitative analysis of alcohol in blood or

urine. The technology of breath-alcohol testing has changed dramatically over the years from chemical oxidation and colorimetric procedures towards physicochemical techniques such as gas chromatography, electrochemical oxidation, and multiple wavelength infrared spectrophotometry. In the early 1980s evidential breath-alcohol instruments were approved for law enforcement purposes in many European countries and threshold limits of BrAC were introduced alongside the existing statutory BAC limits.

Jones, A. W. (2008). Ultra-rapid rate of ethanol elimination from blood in drunken drivers with extremely high blood-alcohol concentrations. *International Journal of Legal Medicine, 122*(2), 129-134.
The rate of alcohol elimination from blood was determined in drunken drivers by taking two blood samples about 1 h apart. These cases were selected because the individuals concerned had reached an extremely high blood-alcohol concentration (BAC) when they were apprehended. This suggests a period of continuous heavy drinking leading to the development of metabolic tolerance. Use of double blood samples to calculate the elimination rate of alcohol from blood is valid provided that drunken drivers are in the post-absorptive phase of the BAC curve, the time between sampling is not too short, and that zero-order elimination kinetics operates. Evidence in support of this came from other drunken drivers in which three consecutive blood samples were obtained at hourly intervals. The mean BAC (N = 21) was 4.05 g/l (range, 2.71-5.18 g/l), and the average rate of alcohol elimination from blood was 0.33 g l(-1) h(-1) with a range of 0.20-0.62 g l(-1) h(-1). The possibility of ultra-rapid rates of ethanol elimination from blood in drunken drivers having extremely high BAC deserves to be considered in forensic casework, e.g., when retrograde extrapolations and other blood-alcohol calculations are made. The mechanism accounting for more rapid metabolism is probably related to induction of the microsomal enzyme (CYP2E1) pathway for ethanol oxidation, as one consequence of continuous heavy drinking. However, the dose of alcohol and the duration of drinking necessary to boost the activity of CYP2E1 enzymes in humans have not been established.

Jones, A. W., & Andersson, L. (1996). Influence of age, gender, and blood-alcohol concentration on the disappearance rate of alcohol from blood in drinking drivers. *Journal of Forensic Sciences, 41*(6), 922-926.
The rate of disappearance of alcohol from the blood (beta-slope) was determined in drinking drivers by taking two blood samples about 60 min apart (mean 68 min, span 30 to 120 min). The results were compared for men and women as a function of their age and the prevailing blood-alcohol concentration (BAC). The material consisted of 1090 double blood samples from 976 men and 114 women with mean age 36.6 +/- 12.9 y (+/- SD) and 38.0 +/- 12.3 y (+/- SD), respectively. The mean BAC for the male DUI suspects was 1.88 +/- 0.748 mg/mL (+/- SD) compared with 1.86 +/- 0.702 (+/- SD) for the females. The relationship between beta-slope (y) and BAC (x) was y = 0.175 + 0.009x with a small positive correlation (r = 0.13) and standard error estimate (Syx) of 0.049 mg/mL. The mean beta-slope for female DUI suspects was 0.214 +/- 0.053 mg/mL/h (+/- SD), compared with 0.189 +/- 0.048 mg/mL/h in

the male suspects, and this small difference was statistically highly significant (t = 5.21, p < 0.001). The overall mean rate of alcohol elimination from blood in drinking drivers was 0.191 +/- 0.049 mg/mL/h (+/- SD), and the 95% limits of agreement (LOA) spanned from 0.09 to 0.29 mg/mL/h. The value of the beta-slope was slightly steeper starting from a high initial BAC but was not much influenced by the person's age.

Jones, A. W., & Jonsson, K. A. (1994). Food-induced lowering of blood-ethanol profiles and increased rate of elimination immediately after a meal. *Journal of Forensic Sciences, 39*(4), 1084-1093.

In a two-part crossover study, ten healthy men drank a moderate dose of ethanol (0.80 g/kg) in the morning after an overnight fast or immediately after breakfast. The breakfast consisted of orange juice (150 mL), fruit yogurt (250 mL), two cheese sandwiches, one boiled egg, and one cup of coffee with milk and sugar. Ethanol was determined in venous blood at various times after the start of drinking by headspace gas chromatography. All subjects felt less intoxicated when alcohol was ingested after breakfast compared with drinking on an empty stomach. The peak BAC (+/- SD) was 67 +/- 9.5 mg/dL (ethanol + food) compared with 104 +/- 16.5 mg/dL when the drinking occurred after an overnight fast (P 6h) was 398 +/- 56 mg/dL x h in the fasting state compared with 241 +/- 34 mg/dL x h when subjects drank alcohol after the meal (P < 0.001). The time required to metabolize the dose of ethanol was approximately two hours shorter after the subjects had eaten breakfast. These results suggest that food in the stomach before drinking not only leads to a lowering of the peak BAC and diminishes the feelings of intoxication, but also boosts the rate of ethanol metabolism. A food-induced increase in the rate of disposal of ethanol was also confirmed when subjects ate a meal 5 h after drinking, that is, when the postabsorptive phase of ethanol metabolism was well established. The mean rate of disappearance of alcohol from blood was increased by between 36 and 50%.

Jones, A. W., Jonsson, K. A., & Jorfeldt, L. (1989). Differences between capillary and venous blood-alcohol concentrations as a function of time after drinking, with emphasis on sampling variations in left vs right arm. *Clinical Chemistry, 35*(3), 400-404.

Twelve healthy men drank 0.8 g of ethanol per kilogram of body weight during 30 min after an overnight (10 h) fast. At nine exactly timed intervals (30-390 min after the start of drinking), blood was sampled through indwelling catheters in cubital veins on the left and right arms. Immediately thereafter, capillary blood was sampled from fingertips on the left and right hands. The blood ethanol concentration (BAC) was determined by headspace gas chromatography. The SD for alcohol determinations in venous blood, including the left vs right arm sampling variation, was 30 mg/L (range 8.3-83 mg/L), whereas for capillary blood the SD was 35 mg/L (range 11-60 mg/L). This difference much exceeded the purely analytical errors: SD = 2.67 mg/L for venous blood and 14.2 mg/L for fingertip blood. During the first 60 min after the subjects started to drink, capillary BAC exceeded venous BAC, the mean difference at 30 min being 136 mg/L (range 36-216 mg/L). In the postabsorptive state later than 60 min after drinking, venous BAC exceeded capillary

BAC [mean difference 58 mg/L (range 0.0-170 mg/L]), the values for venous and capillary BAC crossing 37 min (range 6-77 min) after the end of drinking. Apparently, the source of blood analyzed, venous or capillary, must be considered in clinical pharmacokinetic studies of ethanol.

Jones, A. W., Jonsson, K. A., & Neri, A. (1991). Peak blood-ethanol concentration and the time of its occurrence after rapid drinking on an empty stomach. *Journal of Forensic Sciences, 36*(2), 376-385.
Healthy men, 20 to 60 years old, drank a moderate dose of ethanol in the morning after an overnight fast. They consumed either neat whisky in amounts corresponding to 0.34, 0.51, 0.68, 0.85, or 1.02 g of ethanol per kilogram of body weight or 0.80 g/kg ethanol solvent diluted with orange juice. The peak blood-ethanol concentration (BEC) increased with the dose administered, but the time required to reach the peak was not markedly influenced over the range of doses studied. At a dose of 0.68 g/kg, the peak BEC ranged from 52 to 136 mg/dL (N = 83), and slow absorption (a late-occurring peak) produced a lower peak BEC. The peak BEC was reached between 0 and 45 min for 77% of the subjects (N = 152) and between 0 and 75 min for 97% of them. The time of peaking in venous blood occurred, on average, 10 min later than in capillary (fingertip) blood although the peak BEC was not appreciably different; the mean venous BEC was 97.0 mg/dL (range, 76 to 112 mg/dL), and the mean capillary BEC was 99.6 mg/dL (range, 75 to 123 mg/dL). When subjects drank 0.80 g/kg ethanol diluted with orange juice over 30 min, the average BEC increment between the end of drinking and the peak was 33 mg/dL (range, 0 to 58 mg/dL). The rate of absorption of ethanol was 1.78 mg/dL/min (range, 0.52 to 4.8 mg/dL/min), and the peak BEC occurred within 60 min after the end of drinking in 92% of the trials. The largest BEC increment (mean, 21 mg/dL; range, 0 to 44 mg/dL) was seen during the first 15 min after the drinking period.

Jones, A. W., Jorfeldt, L., Hjertberg, H., & Jonsson, K. A. (1990). Physiological variations in blood ethanol measurements during the post-absorptive state. *Journal - Forensic Science Society, 30*(5), 273-283.
Specimens of arterial plasma and venous whole blood were obtained at 3-10 min intervals during the post-peak phase of ethanol metabolism in healthy volunteers. The concentrations of ethanol in blood and plasma were determined by headspace gas chromatography. This method had a standard deviation of 0.28 mg/dl for whole blood and 0.26 mg/dl for plasma and the coefficients of variation were 0.43% and 0.79% respectively. The physiological variation from time-to-time, expressed as the residual standard deviation after fitting the ethanol concentration-time regression relationships, ranged from 0.43-3.7 mg/dl (0.65-16%). The time-to-time variations in concentrations of ethanol were maximum when there were problems in getting an unimpeded flow of blood through the indwelling catheters. The results do not support the existence of sporadic fluctuations or spiking in the blood alcohol concentration-time profile during the post-absorptive state. Instead, this study underscores the need to control carefully the method of sampling blood and in this way keep pre-analytical sources of variation to a minimum.

Jones, A. W., Norberg, A., & Hahn, R. G. (1997). Concentration-time profiles of ethanol in arterial and venous blood and end-expired breath during and after intravenous infusion. *Journal of Forensic Sciences, 42*(6), 1088-1094.
Ethanol (0.40 g/kg) was administered to 13 healthy men by intravenous (i.v.) infusion at a constant rate for 30 min. The concentrations of ethanol in arterial blood (ABAC), venous blood (VBAC), and end-expired breath (BrAC) were measured at 17 exactly timed intervals. Blood-ethanol was determined by headspace gas chromatography and breath-ethanol was measured with a quantitative infrared analyzer (DataMaster). BrAC was multiplied by 2300 to estimate the concentrations of alcohol in blood. During the infusion of ethanol, ABAC exceeded VBAC by about 10 mg/dL on the average and ABAC was also higher than BrAC x 2300 by about 4 mg/dL on average. When infusion of alcohol ended, ABAC, VBAC, and BrAC were 94.8 +/- 2.06 (+/- SE), 84.7 +/- 1.54, and 89.3 +/- 2.10 mg/dL, respectively. The concentrations of alcohol in blood (ABAC and VBAC) and breath decreased abruptly after the administration of alcohol stopped and by 5 min postinfusion, the A-V differences in concentration of ethanol were small or negligible. The mean apparent half-life of the distribution plunge was 7 to 8 min, being about the same for ABAC, VBAC, and BrAC. The disappearance rate of ethanol was 15.5 +/- 0.55 mg/ dL/h (mean +/- SE) for arterial blood, 15.2 +/- 0.49 mg/dL/h for venous blood, and 16.3 +/- 0.73 mg/230 L/h for breath; no significant differences were noted ($p > 0.05$). We conclude that A-V differences in the concentration of ethanol exist during the loading phase but are rapidly abolished when the administration of ethanol terminates. In the post-absorptive phase of ethanol kinetics, when alcohol has mixed with the total body water, VBAC exceeds ABAC by about 1-2 mg/100 mL on average.

Jones, A. W., Wigmore, J. G., & House, C. J. (2006). The course of the blood-alcohol curve after consumption of large amounts of alcohol under realistic conditions. *Canadian Society of Forensic Science Journal*, *39*(3), 125-140.
This article presents a review and appreciation of an article by Zink and Reinhardt (Z & R) dealing with the time-course of blood-alcohol curves and pharmacokinetic parameters in healthy men after they drank large amounts of alcohol under controlled real-world conditions. Here we present a reappraisal of this published study to highlight certain aspects of interest for forensic casework, such as when expert testimony is presented on the pharmacokinetics of ethanol. Healthy men, all regular drinkers, consumed large doses of alcohol (3.0–5.7 g/kg body weight) in a social setting for 5 to 10 hours. According to preference, the men drank beer, stomach bitters, or spirits in the company of a girlfriend or spouse. Food was available during the drinking session and the men were allowed to watch video films or play cards. Specimens of venous blood were taken from indwelling catheters every 15 to 30 minutes during and after the end of drinking and the concentrations of ethanol were determined in duplicate by both gas chromatography and enzymatic oxidation. The mean of the four measurements was used to plot concentration-time profiles of alcohol for each subject. The average Cmax was 2.65 g/kg (range 1.92–3.80 g/kg) and tmax occurred at 425 min (range 250–608 min) after the start of drinking. In five of the 14 drinking studies, Cmax occurred before the subjects

finished their last drink; mean time to peak after the end of drinking was 2 min (range – 56 to 50 min). The rate of alcohol elimination from blood was 0.167 g/kg/h on average (range 0.11 to 0.26 g/kg/h) and only one subject exceeded 0.20 g/kg/h. The average volume of distribution of alcohol (Widmark's rho factor) was 1.05 (range 0.77–1.32), being considerably higher than expected from knowledge of the water content of the blood and the whole body. The abnormally high rho-factors suggest an appreciable pre-systemic metabolism of alcohol, either in the gut or the liver or both organs, when drinking continues for 5–10 hours. The rate of alcohol elimination from blood was not much different from many bolus dose drinking experiments (mean 0.15 g/kg/h). It seems that continuous heavy drinking for days or weeks is necessary to increase the activity of microsomal enzymes (CYP2E1) and cause a faster elimination rate of alcohol from blood. There were no unexpected irregularities in the concentrations of alcohol between successive blood samples, which does not support the notion of a so-called steepling effect in the post-absorptive state.

Jones, S. C., & Gregory, P. (2009). The impact of more visible standard drink labelling on youth alcohol consumption: Helping young people drink (ir)responsibly? *Drug & Alcohol Review, 28*(3), 230-234.
Introduction and Aims: In response to increasing concerns about excessive drinking among young people the Australian alcohol industry announced that it will introduce more visible standard drink labels. This study sought to examine whether young people use this information in a way that decreases, or increases, alcohol-related harms.
Design and Methods: Six focus groups with students enrolled in an undergraduate university course in a large regional city in New South Wales, recruited by direct approach on the university grounds and via an online message posted on the university bulletin board.
Results: The majority of the participants reported that they are aware of the existence of standard drink labelling; notice standard drink labels; and take these into account when choosing what to purchase. However, this was predominantly to help them choose the strongest drinks for the lowest cost.
Discussion and Conclusions: This study provides initial evidence to support the view that standard drink labelling, in isolation of other modifications to product packaging and marketing, is likely to serve to further increase heavy drinking among young people. Jones SC, Gregory P. The impact of more visible standard drink labelling on youth alcohol consumption: Helping young people drink (ir)responsibly?

Kerr, W. C., Fillmore, K. M., & Marvy, P. (2000). Beverage-specific alcohol consumption and cirrhosis mortality in a group of English-speaking beer-drinking countries. *Addiction, 95*(3), 339-346.
AIMS: To compare beverage-specific per capita consumption and total alcohol consumption's associations with cirrhosis mortality rates in multiple countries.
DESIGN: Pooled cross-sectional time-series analysis.
SETTING: Australia, Canada, New Zealand, the United Kingdom and the United States during the years 1953-1993.

MEASUREMENTS: National level data on per capita total alcohol, beer, wine and spirits consumption and standardized all-cause cirrhosis mortality rates.
FINDINGS: Significant associations with cirrhosis mortality are found for both total ethanol and spirits. Spirits consumption is found to make up the majority of the effect of alcoholic beverage consumption on cirrhosis mortality and the model including only spirits is found to fit the data at least as well as the model including only total ethanol consumption. The lag relationship between all alcohol types and cirrhosis is found to be short with only present and 1 year's lagged consumption having significant associations.
CONCLUSIONS: Spirits consumption rather than beer or wine is associated with cirrhosis mortality in this group of primarily beer-drinking countries. This finding offers important clues to understanding the drinking behaviors associated with cirrhosis mortality on the individual level.

Kerr, W. C., Greenfield, T. K., & Midanik, L. T. (2006). How many drinks does it take you to feel drunk? Trends and predictors for subjective drunkenness. *Addiction, 101*(10), 1428-1437.
Aims To describe and model the sources of the variation and trends in the meaning of subjective drunkenness. Design Trend analyses of three cross-sectional surveys. Setting US general population. Participants Those who report being drunk in the past year among those in the 1979, 1995 and 2000 National Alcohol Surveys. Measurements Number of drinks reported to feel drunk (dependent variable), past-year alcohol consumption measures, beverage preference, state drunk driving blood alcohol concentration (BAC) limit and demographics. Findings The mean reported number of drinks to feel drunk declined significantly between each survey and was significantly lower for women. Considerable variation was also found within surveys and was explained partially by available variables. Volume of alcohol and heavy drinking occasions were associated positively with the number of drinks to feel drunk. Higher educational attainment was associated negatively as was being a wine drinker, of older age, of African American ethnicity and of becoming drunk more frequently than once per month. Living in a state with a per se BAC limit of 0.08% was associated negatively in models for men. Conclusions A substantial shift downward in the meaning of drunkenness occurred in the US between 1979 and 2000. This may be explained partly by the increase in educational attainment, the ageing of the population, the decline in per capita alcohol consumption and changes in alcohol policy towards lower BAC limits for drunk driving along with greater penalties, enforcement and awareness.

Kerr, W. C., Greenfield, T. K., & Tujague, J. (2006). Estimates of the mean alcohol concentration of the spirits, wine, and beer sold in the United States and per capita consumption: 1950 to 2002. *Alcoholism: Clinical & Experimental Research, 30*(9), 1583-1591. doi:10.1111/j.1530-0277.2006.00190.x
Background: Estimates of per capita consumption of alcohol in the United States require estimates of the mean alcohol content by volume (%ABV) of the beer, wine, and spirits sold to convert beverage volume to gallons of pure alcohol.
Methods: The mean %ABV of spirits is estimated for each year from 1950 to 2002

and for each state using the %ABV of major brands and sales of sprits types. The mean %ABV of beer and wine is extrapolated to cover this period based on previous estimates. These mean %ABVs are then applied to alcohol sales figures to calculate new yearly estimates of per capita consumption of beer, wine, spirits, and total alcohol for the United States population aged 15 and older.
Results: The mean %ABV for spirits is found to be lower than previous estimates and to vary considerably over time and across states. Resultant per capita consumption estimates indicate that more alcohol was consumed from beer and less from wine and spirits than found in previous estimates.
Conclusions: Empirically based calculation of mean %ABV for beer, wine, and spirits sold in the United States results in different and presumably more accurate per capita consumption estimates than heretofore available. Utilization of the new estimates in aggregate time-series and cross-sectional models of alcohol consumption and related outcomes may improve the accuracy and precision of such models.

Kerr, W. C., Patterson, D., Koenen, M. A., & Greenfield, T. K. (2008). Alcohol content variation of bar and restaurant drinks in northern California. *Alcoholism: Clinical and Experimental Research, 32*(9), 1623-1629.
Objective: To estimate the average of and sources of variation in the alcohol content of drinks served on premise in 10 Northern Californian counties.
Methods: Focus groups of bartenders were conducted to evaluate potential sources of drink alcohol content variation. In the main study, 80 establishments were visited by a team of research personnel who purchased and measured the volume of particular beer, wine, and spirit drinks. Brand or analysis of a sample of the drink was used to determine the alcohol concentration by volume.
Results: The average wine drink was found to contain 43% more alcohol than a standard drink, with no difference between red and white wine. The average draught beer was 22% greater than the standard. Spirit drinks differed by type with the average shot being equal to one standard drink while mixed drinks were 42% greater. Variation in alcohol content was particularly wide for wine and mixed spirit drinks. No significant differences in mean drink alcohol content were observed by county for beer or spirits but one county was lower than two others for wine.
Conclusions: On premise drinks typically contained more alcohol than the standard drink with the exception of shots and bottled beers. Wine and mixed spirit drinks were the largest with nearly 1.5 times the alcohol of a standard drink on average. Consumers should be made aware of these substantial differences and key sources of variation in drink alcohol content, and research studies should utilize this information in the interpretation of reported numbers of drinks.

Kerr, W. C., & Stockwell, T. (2012). Understanding standard drinks and drinking guidelines. *Drug and Alcohol Review, 31*(2), 200-205.
Introduction and Aims: For consumers to follow drinking guidelines and limit their risk of negative consequences they need to track their ethanol consumption. This paper reviews published research on the ability of consumers to utilise information about the alcohol content of beverages when expressed in different forms, for

example in standard drinks or units versus percentage alcohol content.
Design and Methods: A review of the literature on standard drink definitions and consumer understanding of these, actual drink pouring, use of standard drinks in guidelines and consumer understanding and use of these.
Results: Standard drink definitions vary across countries and typically contain less alcohol than actual drinks. Drinkers have difficulty defining and pouring standard drinks with over-pouring being the norm such that intake volume is typically underestimated. Drinkers have difficulty using percentage alcohol by volume and pour size information in calculating intake but can effectively utilise standard drink labelling to track intake. Discussion and Conclusions: Standard drink labelling is an effective but little used strategy for enabling drinkers to track their alcohol intake and potentially conform to safe or low-risk drinking guidelines.

Kidorf, M., Sherman, M. F., Johnson, J. G., & Bigelow, G. E. (1995). Alcohol expectancies and changes in beer consumption of first-year college students. *Addictive Behaviors, 20*(2), 225-231.
The present study used a prospective design to evaluate the relationship between alcohol expectancies and the progression of beer consumption of first-year college students over a 2-month period. One hundred and fifty-four first-year undergraduate students completed the Alcohol Expectancy Questionnaire (AEQ; Brown, Goldman, Inn, & Anderson, 1980) and a measure of precollege drinking during their first week of college, and completed a retrospective diary account of alcohol consumption also during the first week and at 1-month and 2-month follow-up. Beer was consumed considerably more frequently than other alcoholic beverages and was used as the dependent measure. The results showed that each AEQ subscale was positively correlated with beer consumption at almost all time points, and the magnitude of these correlations was generally higher for male subjects. Furthermore, the expectancies that alcohol increases social assertiveness and that alcohol is associated with global, positive changes were positively correlated with increases in beer consumption from Session 1 to Session 2 and from Session 1 to Session 3 for male, but not female, subjects. The findings extend previous research by demonstrating that certain alcohol expectancies are related to progressive increases over time in the amount of beer consumed.

Klatsky, A. L., Armstrong, M. A., & Kipp, H. (1990). Correlates of alcoholic beverage preference: Traits of persons who choose wine, liquor, or beer. *British Journal of Addiction, 85*(10), 1279-1289.
We studied correlates of wine, hard liquor or beer preference among 53 172 white men and women in a Northern California prepaid health plan. Preference for a beverage type was reported by 51% of drinkers; 22% of persons with a preference reported exclusive use of the preferred beverage. Persons who prefer wine are likely to be women, temperate, young or middle-aged, non-smokers, better educated and free of symptoms or risk of illness. Persons who prefer liquor are likely to be men, heavier drinkers, middle-aged or older, less educated and afflicted with symptoms or risk factors for major illnesses. Persons who prefer beer are likely to be young men who are intermediate between wine and liquor preferrers for most traits. The traits of

persons reporting exclusive use of a beverage type were similar. These data identify correlates of beverage choice which need to be controlled for in alcohol-health studies.

Labianca, D. A., & Simpson, G. (1996). Statistical analysis of blood- to breath-alcohol ratio data in the logarithm-transformed and non-transformed modes. *European Journal of Clinical Chemistry & Clinical Biochemistry, 34*(2), 111-117.
The statistical analysis of non-transformed and logarithm-transformed blood- to breath-alcohol ratios ("blood/breath ratios") is detailed. The data analyzed were derived from 137 simultaneous blood-alcohol and breath-alcohol concentration measurements made between 15 and 179 min after the end of drinking, with 136 of the measurements obtained during the 15- to 124-min time frame. Although the distribution of the non-transformed ratios is positively skewed, and that of the logarithm-transformed data more closely approximates the normal distribution upon visual inspection, both analyses generated results that do not differ significantly from each other when considered in the context of "mean ratios + or - 2SD". This is in accord with the results of the Kolmogorov-Smirnov goodness-of-fit test, which does not reject either dataset and demonstrates that both are approximately normal. Since the logarithm-transformed data generate more conservative statistical blood/breath ratio ranges than the non-transformed data, they were selected as the basis for the principal conclusion of this work. That conclusion is a refutation of the argument that, breath-alcohol analyzers relying on a 2100:1 blood/breath ratio tend to underestimate the blood-alcohol concentrations of driving-while-intoxicated arrestees because the commonly accepted mean postabsorptive ratio is 2300:1. In fact, whenever the absorption status of a driving-while-intoxicated arrestee at the time of a breath test cannot be definitively established, the results of this work support the application of a relative error range of -40% to +28% for 95% of the population, based on a statistical blood/breath ratio range of 1259:1 to 2679:1, and -46% to +42% for 99% of the population, based on a statistical range of 1128:1 to 2989:1.

Lands, W. E. (1998). A review of alcohol clearance in humans. *Alcohol, 15*(2), 147-160.
The level of blood or brain alcohol is considered to influence alcohol ingestion by causing subjective perceptions or neural activations that are reinforcing or rewarding. Alcohol-dependent people may try to maintain some desired tissue level, drinking to replace the millimolar levels that were cleared from the blood by metabolism. The biomedical literature describes many approaches to understanding the role of blood alcohol levels in human physiology and behavior, and this review examines some of the published results. They include the general kinetics of intake and removal of beverage alcohol as well as the characteristics of many different catalysts that can interact with alcohol. Because ingested alcohol creates blood levels that are a 1000-fold greater than those normally experienced during abstinence, ethanol may impose itself as an alternate substrate for the many oxidoreductases that act physiologically on other endogenous alcohols. Many enzymes that can act on millimolar ethanol have been isolated, and their structural genes are sequenced. Unfortunately, the genetic sequence does not indicate the physiological material

upon which the translated gene product may act. In a sense, the set of enzymes with catalytic sites occupied by millimolar ethanol during alcohol drinking might constructively be regarded as "orphan gene products" whose physiological role remains to be clarified. This review is designed to indicate some of what is known, what is not known, and what needs to be known to improve the interpretations regarding adaptations to beverage alcohol and the ability of millimolar levels of alcohol to diminish dysphoria. The dysphoria may be influenced by ethanol, by ethanol metabolites, or by altered metabolism of currently unspecified endogenous substrates. A major challenge is to evaluate the multiple alternative variables within a context that stimulates curiosity and encourages quantitative tests of the relative contribution of each variable to the overall physiology of an individual.

Lemmens, P. H. (1994). The alcohol content of self-report and 'standard' drinks. *Addiction, 89*(5), 593-601.
A stubborn problem in alcohol epidemiology is that of standardization of unit of measurement. Consistent use of the 'standard drink' in research reports is hampered by difficulties in the assessment of the alcohol content of, particularly, self-reported drinks. Alcohol content of a drink depends on strength of the beverage and volume of the glass or container from which the beverage is taken. Both factors vary considerably between times, regions and individuals. Interview protocols and questionnaires rarely take into account the fact that people consume alcoholic beverages from a large variety of glasses and containers. In the present study the common presumption is tested of equality of alcohol content of standard and self-reported drinks. The test consisted of measuring the amount of wine, fortified wine and spirits people usually pour in the glass typical for the beverage type. The sample was drawn from the general Dutch population in 1985. The results show that on average self-reported drinks taken at home contained more than the presumed standard (10 g per drink). The deviation was highest for spirits (+26%), followed by fortified wines (+14%) and least for wine (+4%). There seemed to be a positive relationship between deviation from 'standard' and strength of the alcoholic beverage. This result is in line with data on the coverage of sales data: aggregate, survey-based spirits consumption shows the lowest coverage of sales. The effect of the difference between actual and presumed content of drinks on estimates of consumption is an overall increase of 7.5%, higher for women (+12%) than for men (+6%). Results are discussed with respect to the use of the concept of 'standard unit' in research protocols and health education campaigns.

Lemmens, P., Tan, E., & Knibbe, R. (1992). Measuring quantity and frequency of drinking in a general population survey: A comparison of five indices. *Journal of Studies on Alcohol and Drugs, 53*(5), 476-486.
This article compares five indices of alcohol consumption in a general population survey conducted in 1985 in the Netherlands. Self-reports of consumption were obtained with a prospective diary, a retrospective 7-day recall method, and three summary measures, such as a quantity-frequency index. The coverage of sales data appeared highest for the diary (67%), which suggests a higher validity. Special attention was given to comparisons of quantity and frequency of drinking between

the diary, on the one hand, and the weekly recall and summary measures, on the other. It was found that underreporting, relative to the diary reports, was generally higher in the frequency than in the quantity domain. This result, together with the finding from longitudinal studies that intraindividual variation is also higher for drinking frequency, leads to the conclusion that forgetting is a potent source of undercoverage in surveys and to the hypothesis that large differences in overall drinking pattern between populations (e.g., in regularity of drinking) may account for the large differences in coverage rates of sales data. Furthermore, the subjectively assessed probability of drinking by means of a usual frequency question appeared a poor predictor of (diary) drinking frequency for respondents reporting a low or moderate frequency. For subjects claiming a high usual drinking frequency, a reasonable correspondence between diary and summary measures was found. This mitigates the fear often expressed that heavy drinkers particularly underreport their consumption.

Lester, D., & Pandina, R. J. (1983). How to use the Alco-Calculator. New Brunswick, NJ: Alcohol Research Documentation, Inc. The Alco-Calculator was one of the first tools to calculate blood alcohol concentrations. It is a sliding ruler device based on scientific data and research considering several variables such as ounces of beverage consumed by type (beer, light beer, 100 proof spirits, 80 proof spirits, 60 proof spirits, 20% wine, 12% wine) quantities (ounces, bottles) body weight, and hours since start drinking, as well as gender. The alignment scales allow the estimation of various beverage amounts too.

Logan, B. K., Case, G. A., & Distefano, S. (1999). Alcohol content of beer and malt beverages: Forensic consideration. *Journal of Forensic Sciences*, *44*(6), 1292-1295. Beer consumption is commonly an issue in a medico-legal setting, requiring estimates either of a likely blood alcohol concentration (BAC) for a given pattern of consumption or vice versa. Four hundred and four beers and malt beverages available for sale in the State of Washington were tested by gas chromatography for their alcohol content. Considerable variability in the alcoholic strength was found, even within the same class. Overall the range of concentrations was 2.92%v/v to 15.66%v/v. The mean alcohol concentration for ales was 5.51%v/v (SD 1.23%v/v), and for lagers, 5.32% (SD 1.43%v/v). Some specialty brews had characteristically higher or lower mean concentrations: ice beers 6.07%v/v, malt liquor 7.23%v/v, light beer 4.13%v/v, seasonal ales 6.30%v/v. Six brands of lager and four light beers account for the majority of all beer sales in the United States, and the mean alcohol concentration for these products was measured as 4.73%v/v and 4.10%v/v respectively. Few of the beers (17%) were labeled with respect to alcohol content, and in some cases, there was a significant disparity between the concentration listed on the label, and the measured alcohol concentration. Toxicologists need to exercise caution when performing Widmark type calculations, using all available information to select the most appropriate estimate for alcohoic strength of a beer or malt beverage.

Marshall, T. A. (2011). Dietary guidelines for Americans, 2010. *Journal of the American Dental Association (JADA), 142*(6), 654-656.
The article offers information on the Dietary Guidelines for Americans 2010 developed by the U.S. Department of Agriculture (USDA) which consider various nutritional science, food supply changes, and influence of environment. It states that the guidelines stresses the value of caloric balance and foods with nutrients. It says that oral health practitioners need to familiarize on the guidelines to help their patients to have better choices of food for their oral and systematic health.

Martin, C. S., & Nirenberg, T. D. (1991). Alcohol content variation in the assessment of alcohol consumption. *Addictive Behaviors, 16*(6), 555-560. Most investigators have not adequately accounted for the alcohol content of different beverages when assessing alcohol consumption. Considerable research has assessed consumption in terms of the number of standard drinks. A problem with standard drink measures is that different distilled spirits, wines, and malt beverages vary considerably in alcohol content. State-to-state and brand-to-brand variations in the strength of different malt beverage brands are provided, as malt beverage alcohol contents are not contained on labels due to federal and state regulations. Ignoring alcohol content variation when estimating consumption can produce a large amount of error. Alcohol consumption should be assessed in terms of the number, size, and alcohol content of beverages

Maxwell, D. B. S. (1993). Beer cans: A guide for the archaeologist. *Historical Archaeology, 27*(1), 95-113.
Beer cans are potentially useful as tools for dating later components in historical sites, and for determining the time of intrusion into prehistoric sites. Changes in major and minor design features are sufficiently documented to yield age estimates accurate to within five years of production. Even in cases of poor can preservation, general trends in shape and construction should provide an estimate accurate to within a decade. This article details both morphological and stylistic changes for the purpose of providing a basic guide to the dating of beer cans.

Miller, W. R., Heather, N., & Hall, W. (1991). Calculating standard drink units: International comparisons. *British Journal of Addiction, 86*(1), 43-47.
Simple calculation rules are providing for converting alcohol consumption data among four standard units currently used by researchers and educators in the USA, Canada, the UK, and Australia. A plea is made for the adoption of a common method for reporting alcohol consumption in research, using metric fluid volume units.

Mulford, H. A., & Miller, D. E. (1959). Drinking in Iowa. I. Sociocultural distribution of drinkers; with a methodological model for sampling evaluation and interpretation of findings. *Quarterly Journal of Studies on Alcohol*, 20, 704.
The first in a series of articles reporting the findings of a sociological ad socio-psychological study of the drinking practices in Iowa outlines a conceptual framework for this type of investigation. A definition of drinking behavior includes

the fact and extent of drinking, preoccupation with alcohol, and disturbances in the interpersonal relations due to drinking. Measurements are also provided for each. Social-psychological factors involve he definition of of alcohol, while sociocultural factors entail the major variables for the study.

National Institute on Alcohol Abuse and Alcoholism (2003). State of the science report on the effects of moderate drinking.
http://pubs.niaaa.nih.gov/publications/ModerateDrinking-03.htm

In support of the planned 2005 update of the Dietary Guidelines, NIAAA has been asked to assess the strength of the evidence related to health risks and potential benefits of moderate alcohol consumption, with particular focus on the areas of cardiovascular disease, breast cancer, obesity, birth defects, breastfeeding, and aging.(Pharmacokinetics and Pharmacodynamics, Demographics, Definition of "moderate", Drinking Patterns, Drink size) According to their web site, it was updated February 2, 2007

Norberg Å., Jones, A. W., Hahn, R. G., & Gabrielsson, J. L. (2003). Role of variability in explaining ethanol pharmacokinetics: Research and forensic applications. *Clinical Pharmacokinetics, 42*(1), 1-31.
Variability in the rate and extent of absorption, distribution and elimination of ethanol has important ramifications in clinical and legal medicine. The speed of absorption of ethanol from the gut depends on time of day, drinking pattern, dosage form, concentration of ethanol in the beverage, and particularly the fed or fasting state of the individual. During the absorption phase, a concentration gradient exists between the stomach, portal vein and the peripheral venous circulation. First-pass metabolism and bioavailability are difficult to assess because of dose-, time- and flow-dependent kinetics. Ethanol is transported by the bloodstream to all parts of the body. The rate of equilibration is governed by the ratio of blood flow to tissue mass. Arterial and venous concentrations differ as a function of time after drinking. Ethanol has low solubility in lipids and does not bind to plasma proteins, so volume of distribution is closely related to the amount of water in the body, contributing to sex- and age-related differences in disposition. The bulk of ethanol ingested (95-98%) is metabolised and the remainder is excreted in breath, urine and sweat. The rate-limiting step in oxidation is conversion of ethanol into acetaldehyde by cytosolic alcohol dehydrogenase (ADH), which has a low Michaelis-Menten constant (Km) of 0.05-0.1 g/L. Moreover, this enzyme displays polymorphism, which accounts for racial and ethnic variations in pharmacokinetics. When a moderate dose is ingested, zero-order elimination operates for a large part of the blood-concentration time course, since ADH quickly becomes saturated. Another ethanol-metabolising enzyme, cytochrome P450 2E1, has a higher Km (0.5-0.8 g/L) and is also inducible, so that the clearance of ethanol is increased in heavy drinkers. Study design influences variability in blood ethanol pharmacokinetics. Oral or intravenous administration, or fed or fasted state, might require different pharmacokinetic models.

Norberg, A., Gabrielsson, J., Jones, A. W., & Hahn, R. G. (2000). Within- and between-subject variations in pharmacokinetic parameters of ethanol by analysis of breath, venous blood and urine. *British Journal of Clinical Pharmacology, 49*(5), 399-408.
AIMS: To evaluate the prerequisites for using ethanol dilution to estimate total body water, we studied the within- and between-subject variation in the parameter estimates of a two-compartment model for ethanol pharmacokinetics with parallel Michaelis-Menten and first-order renal elimination. Because sampling of breath might be preferable in some clinical situations the parameter estimates derived from breath and venous blood were compared. METHODS: On two occasions, ethanol 0.4 g kg-1 was given by intravenous infusion to 16 volunteers after they had fasted overnight. The proposed model was fitted by means of nonlinear regression to concentration-time data measured in the breath, venous blood and urine during 360 min. The model contained six parameters: Vmax and Km (Michaelis-Menten elimination constants), CLd (intercompartmental distribution parameter), VC and VT (volumes of the central and tissue compartment, respectively) and CLR (renal clearance). The volume of distribution, Vss, was calculated as the sum of VC and VT. RESULTS: The mean +/- total s.d. of the parameter estimates derived from blood data were Vmax 95 +/- 25 mg min-1, Km 27 +/- 19 mg l-1, CLd 809 +/- 232 ml min-1, VC 14.5 +/- 4.3 l, VT 21. 2 +/- 4.4 l, CLR 3.6 +/- 2.0 ml min-1 and Vss 35.8 +/- 4.3 l. The variation within subjects amounted to 3%, 9%, 21%, 21%, 17%, 26% and 2%, respectively, of the total variation. Breath samples were associated with a similar or lower variation than blood, both within and between subjects. About 1.5% of the infused ethanol was recovered in the urine. CONCLUSIONS: The low within-subject variation of the key parameter Vss (only 2%) suggests that ethanol dilution analysed by the pharmacokinetic model applied here may be used as an index of the total body water. Breath samples yielded at least as good reproducibility in the model parameters as venous blood.

Ólafsdóttir, H. (1998). The dynamics of shifts in alcoholic beverage preference: Effects of the legalization of beer in Iceland. *Journal of Studies on Alcohol and Drugs, 59*(1), 107-114.
Objective: The purpose of the present study is to examine the changes in alcoholic beverage preference and the underlying social and cultural dynamics that followed the legalization of strong beer in Iceland in 1989.
Method: Data from three nationwide surveys on drinking habits carried out among a random sample of all Icelanders, men and women, 20-69 years old, are analyzed. A questionnaire was mailed to the prospective respondents and in 1988 the response rate was 75.1%, in 1989 it was 73.3% and in 1992 it was 74.7%.
Results: Total alcohol consumption peaked the year after strong beer was introduced, but leveled off in the following years as the novelty of the new beverage faded away and real income declined. A shift in beverage preference towards beer took place as soon as it became available. The survey data indicate that almost all sociodemographic groups are moving from the traditional distilled spirits to weaker beverages, beer in particular. The groups contributing most to the current preference for lighter beverages are those living in the capital area, women, individuals aged 30-49 years, people in the academic professions and management, and men

belonging to the service professions. Conclusions: The results suggest some important conclusions regarding alcohol policy. The collective behavior of drinkers documented in this study supports the view that the general population is an important target group for alcohol policy measures. Particular attention to specific subgroups of drinkers may be applied as a supplementary measure.

Panel discussion V: The message on moderate drinking. (2007). *Annals of Epidemiology, 17*, S110-S111. doi:10.1016/j.annepidem.2007.01.025
This discussion focused on the benefits and risks of moderate drinking in terms of communications to the public, through governmental regulations, official guidelines, the press, and advice to individuals. The panel was chaired by R. Curtis Ellison, with panelists Richard Harding, Arthur Klatsky, Richard Smallwood, Thomas Stuttaford, and Lionel Tiger.

Parry, I. W. H. (2009). Should alcohol taxes be raised? *Regulation, 32*(3), 10-13.
The author suggests the need for U.S. regulators to increase alcohol taxes in the country and highlights the risks posed by alcohol consumption, as of September 2009. He asserts that the current alcohol tax rates in the country are low by historical standards. He notes that alcohol abuse have broader societal costs if it results in reduced workplace productivity. He recommends several non-pecuniary penalties to impose on convicted drunk drivers such as license suspensions and jail terms, or community service in lieu of jail.

Pauly, P. J. (1994). Is liquor intoxicating? Scientists, prohibition, and the normalization of drinking. *American Journal of Public Health, 84*(2), 305-313.
The reliance of current advocates of recreational drug legalization on parallels between "drug prohibition" and the repudiated experiment of National Prohibition in the 1920s invites renewed attention to the history of the legalization and normalization of drinking. A new scientific conception of the nature and effects of alcohol formed an important element in both the politics of repeal and the ensuing legitimation of alcohol consumption. The industrial toxicologist Yandell Henderson argued that alcohol should be considered analogous to carbon monoxide--clearly a poison, yet a normal part of civilized life and only problematic above a determinable and manageable exposure threshold. This argument had political force in the early 1930s as part of the contention that beer was not an "intoxicating liquor." It was more broadly persuasive because it was consistent with Americans' experience with industrial poisons, for which exposure levels had been set by toxicologists such as Henderson. This historical perspective illuminates the more recent reassessment of the risks of alcohol consumption. It also challenges the applicability of the model of the normalization of drinking to proposals to legalize cocaine and opiates.

Rogers, J. D., & Greenfield, T. K. (1999). Beer drinking accounts for most of the hazardous alcohol consumption reported in the United States. *Journal of Studies on Alcohol, 60*(6), 732-739.
Objective: Patterns and correlates of hazardous drinking, defined as occasions in which five or more drinks were consumed in a day, were compared for wine, beer

and distilled spirits.
Method: From a probability sample of the U.S. adult household population, 2,817 respondents who had consumed at least one drink in the previous year were selected for analysis.
Results: The results show that, in the U.S., beer accounts for the bulk of alcohol consumed by the heaviest drinkers. Beer also accounts for a disproportionate share of hazardous drinking. Logistic regression analyses revealed that drinkers who consume beer in a hazardous fashion at least monthly are more likely to be young, male and unmarried, and less likely to be black than are other drinkers. Hazardous beer consumption is more predictive of alcohol-related problems than hazardous consumption of wine or spirits.
Conclusions: Three potential explanations for the results are considered: advertising, beer-drinking subcultures and risk compensation. Additional research is urged in order to better specify the causal role of these and other factors in hazardous beer drinking.

Rush, Benjamin (1805). *Inquiry into the Effects of Ardent Spirits upon the Human Body and Mind*. Philadelphia: Bartam.
Rush was the first to develop a concept of alcoholism as a form of medical disease and proposed that alcoholics should be weaned from their addiction via less potent substances. His Moral and Physical Thermometer is a visual representation of the effects of alcohol on humans.

Sanchez-Craig, M., Wilkinson, A., & Davila, R. (1995). Empirically based guidelines for moderate drinking: 1-year results from three studies with problem drinkers. *American Journal of Public Health, 85*(6), 823-828.
Objectives: The study was conducted to refine guidelines on moderate drinking for problem drinkers, persons whose alcohol use is hazardous or harmful. Information on levels of alcohol intake unlikely to cause problems is useful for health professionals, educators, and policymakers.
Methods: Based on their reports of alcohol-related problems, participants in three studies assessing interventions to reduce heavy drinking (144 men, 91 women) were categorized as "problem-free" or "problem" drinkers at follow-up. Drinking measures were examined to identify patterns separating these outcome categories.
Results: Analyses using 95% confidence intervals for means on drinking measures showed that guidelines should be sex-specific. Based on analyses of positive and negative predictive value, sensitivity, and specificity, it is recommended that men consume no more than 4 standard drinks in any day and 16 standard drinks in any day and 16 drinks in any week, and that women consume no more than 3 drinks in any day and 12 drinks in any week.
Conclusions: These guidelines are consistent with those from several official bodies and should be useful for advising problem drinkers when moderation is a valid treatment goal. Their applicability to the general population is unevaluated.

Skog, O. (1988). The effect of introducing a new light beer in Norway: Substitution or addition? *British Journal of Addiction, 83*(6), 665-668.

In this paper the question is raised if total alcohol consumption may be reduced by introducing new alcoholic, beverages with low alcohol content. May such beverages substitute stronger ones, or will they be added to existing habits? It is argued that this issue deserves more attention in the future. The effects of introducing a new light beer in Norway are analysed from this perspective. The point estimates indicate a substitution, but the effect is not statistically significant.

Smart, R. G. (1996). Behavioral and social consequences related to the consumption of different beverage types. *Journal of Studies on Alcohol and Drugs, 57*(1), 77.
Objective: The purpose of this article is to review the literature on the effects of beer, wine and spirits on the behavioral consequences of alcohol consumption.
Method: The methods involve library research and analysis of the various published articles relating to experimental and survey studies of different effects.
Results: The major results indicate that (1) after spirits consumption blood alcohol concentrations rise more quickly than after beer; (2) for most behavioral tasks beer creates less impairment than brandy at the same dose levels; (3) brandy also leads to more emotional and aggressive responses; (4) those who drink beer or beer and spirits have more alcohol-related problems than others; and (5) beer drinkers are more likely than others to drink and drive, to be arrested for drinking-driving and to be in alcohol-related accidents.
Conclusions: It appears that beer and spirits lead to greater problems than does wine consumption. However, there is a need for more studies of women and confirmed drinkers of various beverages. There is also a need to study the effects of wine consumption on behavioral impairment. Lastly, there is a need to determine if there is a beer-drinking culture which supports heavy drinking and driving after drinking.

Stockwell, T., Blaze-Temple, D., & Walker, C. (1991). A test of the proposal to label containers of alcoholic drink with alcohol content in standard drinks. *Health Promotion International, 6*(3), 207-215.
Health education about alcohol increasingly relies on setting maximum limits for low-risk consumption expressed in terms of 'Standard Drinks' (1 SD = 10g ethyl alcohol). In a sample of 257 West Australian drinkers contacted in a shopping mall, 173 (67.3%) had heard of SDs before but only 46(17.9%) could correctly define one. Subsequently, all subjects were taught how to use the SD system and had to pass a comprehension test before proceeding with an alcohol estimation experiment. A sub-sample of 52 beer drinkers underestimated the combined alcohol content of three cans of beer by a mean of 1.2 SDs when the alcohol content was depicted by the current method of percentage alcohol by volume. The addition of a SD label on each can significantly reduced the mean error to 0.17 SD ($t = 6.78$, $p < 0.0001$). Similarly, 50 wine drinkers underestimated the alcohol content of a half bottle of wine by 0.84 SDs with a percentage label and by only 0.26 SDs when an SD label was added ($t = 4.3$, $p < 0.0001$). After attempting an alcohol estimation task, 63% of the full sample of 257 drinkers reported preferring the SD label, 23% the percentage label and 13% were undecided. SD labels were also preferred by 77% of subjects over alternative labels variously expressing alcohol content in grams of alcohol, decigrams and 'units' of alcohol. The results are interpreted as supporting the proposal that

Standard Drink labelling should be introduced on all alcohol containers to provide greater assistance to drinkers who wish to drink responsibly.

Stockwell, T., Donath, S., Cooper-Stanbury, M., Chikritzhs, T., Catalano, P., & Mateo, C. (2004). Under-reporting of alcohol consumption in household surveys: A comparison of quantity–frequency, graduated–frequency and recent recall. *Addiction, 99*(8), 1024-1033. doi:10.1111/j.1360-0443.2004.00815.x
To compare alternative survey methods for estimating (a) levels of at risk alcohol consumption and (b) total volume of alcohol consumed per capita in comparison with estimates from sales data and to investigate reasons for under-reporting. The homes of respondents who were eligible and willing to participate. A total of 21 674 Australians aged 14 years and older. A 2001 national household survey of drug use, experiences and attitudes with weights applied for age, sex, geographic location and day of week of interview. Self-completion questionnaire using quantity–frequency (QF) and graduated–frequency (GF) methods plus two questions about consumption 'yesterday': one in standard drinks, another with empirically based estimates of drink size and strength. The highest estimate of age 14 + per capita consumption of 7.00 l of alcohol derived from recall of consumption 'yesterday' or 76.8% of the official estimate. The lowest was QF with 49.8%. When amount consumed 'yesterday' was recalled in standard drinks this estimate was 5.27 l. GF questions yielded higher estimates than did QF questions both for total volume (5.25 versus 4.54 l) and also for the proportion of the population at risk of long-term alcohol-related harm (10.6% versus 8.1%). With the detailed 'yesterday' method 61% of all consumption was on high risk drinking days. Questions about typical quantities of alcohol consumed can lead to underestimates, as do questions about drinking 'standard drinks' of alcohol. Recent recall methods encourage fuller reporting of volumes plus more accurate estimates of unrecorded consumption and the proportion of total alcohol consumption that places drinkers at risk of harm. However, they do not capture longer-term drinking patterns. It is recommended that both recent recall and measures of longer-term drinking patterns are included in national surveys.

Stockwell, t., & Room, R. (2012). Constructing and responding to low-risk drinking guidelines: Conceptualisation, evidence and reception. *Drug & Alcohol Review, 31*(2), 121-125. doi:10.1111/j.1465-3362.2011.00416.x
An introduction to the journal is presented where the editor discusses various reports published within the issue, including importance of making public aware about health risks associated with alcohol, problems in alcohol education and low-risk drinking guidelines in Australia.

Stockwell, T., & Stirling, L. (1989). Estimating alcohol content of drinks: Common errors in applying the unit system. *BMJ: British Medical Journal (International Edition), 298*(6673), 571.
Reports the use of the unit system to assess the strengths of drinks with low, standard, and high alcohol contents. Accuracy of the unit system; Implications of underestimation of the strengths of alcoholic drinks; Enumeration of ways in reducing errors in determining the strength of an alcoholic beverage.

Straus, R., & Bacon, S. D. (1953). Drinking in college. New Haven, CT: Yale University Press

This survey of customs and attitudes toward alcohol of 17,000 men and women in 27 colleges reviews who, what, when, where and with whom students drink, reactions to drinking, the influence of previous military service on drinking habits in college, beliefs about drinking and dating and sexual behavior.

Turner, C. (1990). How much alcohol is in a 'standard drink'? An analysis of 125 studies. *British Journal of Addiction, 85*(9), 1171-1175.

A group of researchers have undertaken a review of 125 international, published, epidemiological studies that relate various physical harms to different levels of alcohol consumption. For this review it was necessary to be able to compare the data from the different studies directly. The different measures of alcohol quoted in the studies were converted to the standard measure of grammes of alcohol. The present paper discusses the problems involved in doing this, and gives details of the conversion methods used.

Stowell, A. R., & Stowell, L. I. (1998). Estimation of blood alcohol concentrations after social drinking. Journal of Forensic Sciences, 43(1), 14-21.

Requests for estimates of blood alcohol concentrations (BACs) are often made when blood samples are taken some hours after the time of interest. Many believe that such estimates are not reliable because the subject's alcohol clearance rate is never known and often there is uncertainty as to whether the subject was postabsorptive at the time in question. In order to evaluate the potential errors associated with BAC estimates under these non-ideal conditions, BAC estimates were compared with empirical data obtained from 24 healthy males, ranging in age from 22 to 56 years, who took part in a three hour social drinking session. One blood sample for alcohol analysis was taken from each subject approximately 1 hour after drinking stopped and another was taken approximately 3.5 hours after drinking stopped. Estimations of BACs at the blood sampling time points were made assuming each person had a constant blood alcohol clearance rate in the range of 10 to 20 mg/dL/h (0.01 to 0.02 g/dL/h) over the whole of the experimental period. A variety of methods were used to estimate the volume of distribution for alcohol. All BAC estimations were made assuming complete absorption and full equilibration of the total alcohol dose. The results showed that actual BACs were usually within or very close to the range of "forward" estimates based on the known alcohol doses. Furthermore, most BACs measured about an hour after cessation of drinking were within or very close to the predicted range based on back extrapolation from the actual 3.5 hour BAC result.

Uemura, K., Fujimiya, T., Ohbora, Y., Yasuhara, M., & Yoshida, K. (2005). Individual differences in the kinetics of alcohol absorption and elimination: A human study. *Forensic Science, Medicine, and Pathology*, *1*(1), 24-27.

The individual differences in alcohol pharmacokinetics were studied using the one-compartment model with first-order absorption and zero-order elimination kinetics in humans. The blood alcohol concentrations (BACs) were simulated by obtained parameters, absorption rate constant (ka), and climination rate constant (β). The 81

healthy young Japanese volunteers, who had been divided into those without alcohol-induced facial flushing (nonflushers) and those with facial flushing (flushers) according to alcohol patch test results and a questionnaire beforehand, ingested 0.50 g/kg ethanol within 1 minute. Breath alcohol concentrations (BrACs) were measured during absorption and during the elimination period. BACs were obtained based on BrACs. Fifteen percent of subjects exhibited low BAC profile (below 0.4 mg/mL) (first-pass effect [FPE] group), although the majority showed normal BAC profile (normal group). The ka was approximately 5 to 8 (h^{-1}) in the normal group without significant difference between nonflushers and flushers, whereas that in the FPE group was significantly smaller than in the normal group. For the normal group, peak BACs were well simulated by the one-compartment model with first-order absorption and zero-order elimination kinetics. A considerable portion of subjects exhibited FPE. Absorption of alcohol from the intestine plays an important role in alcohol pharmacokinetics in humans.

White, A. M., Kraus, C. L., Flom, J. D., Kestenbaum, L. A., Mitchell, J. R., Shah, K., & Swartzwelder, H. S. (2005). College students lack knowledge of standard drink volumes: Implications for definitions of risky drinking based on survey data. *Alcoholism: Clinical and Experimental Research, 29*(4), 631-638. doi:10.1097/01.ALC.0000158836.77407.E6

Background: College students tend to pour single servings of beer and liquor that are larger than commonly used standards. The reasons for this are unknown. Students might overpour because they lack knowledge of standard serving sizes. Alternatively, they might know how much alcohol to pour but simply have difficulty pouring the correct amounts. Misperceptions of standard serving sizes could lead to inaccuracies in self-reported consumption. If this is the case, then the validity of students? responses on alcohol surveys and the definitions of risky drinking that are based on them would be called into question. This study examined how college students define standard drinks, whether their definitions are similar to the definitions commonly used by alcohol researchers and government agencies, and whether their definitions of standard drinks are related to the sizes of the drinks that they pour. The study also examined whether feedback regarding the accuracy of their definitions of standard drinks leads students to alter their self-reported levels of consumption.

Methods: Students (N= 133) completed an alcohol survey and performed tasks that required them to free-pour a single beer, glass of wine, shot of liquor, or the amount of liquor in a mixed drink. Roughly half of the students received feedback regarding their definitions of standard drinks. All students then were resurveyed about their recent levels of consumption.

Results: With the exception of beer, students incorrectly defined the volumes of standard servings of alcohol, overestimating the appropriate volumes. They also overestimated appropriate volumes when asked to free-pour drinks. Positive relationships existed between students? definitions of standard drinks and the sizes of the drinks that they free-poured. Feedback regarding misperceptions of standard drink volumes led to an increase in levels of self-reported consumption, suggesting that students' original estimates of their alcohol consumption were too low.

Conclusions: Despite the recent focus on alcohol education and prevention at the college level, college students have not been taught how to define standard drinks accurately. They tend to overstate the appropriate volumes, leading them to overpour drinks and underreport levels of consumption. Self-reported consumption levels are altered by feedback regarding the accuracy of students? definitions of standard drinks. The findings raise important questions about the validity of students' responses on alcohol surveys and the definitions of risky drinking that are based them.

White, A. M., Kraus, C. L., McCracken, L. A., and, & Scott Swartzwelder, H. (2003). Do college students drink more than they think? Use of a free-pour paradigm to determine how college students define standard drinks. *Alcoholism: Clinical & Experimental Research, 27*(11), 1750-1756.
Rationale: Much of what is known about college drinking comes from self-report survey data. Such surveys typically ask students to indicate how many drinks they consume within a given period of time. It is currently unclear whether college students and researchers use similar operational definitions of a single drink. This information is critical given the widespread reliance on survey data for assessing the correlates and consequences of college drinking.
Objectives: This study investigated whether college students define standard drink volumes in a way that is consistent with the operational definitions commonly used by researchers.
Methods: Students (n = 106) were administered an alcohol survey and then asked to perform three tasks. The tasks involved free-pouring fluid into empty cups of different sizes and estimating the volume of a single beer, a shot of liquor, or the amount of liquor in a mixed drink. The volumes poured by students then were compared with standards used in a well-known nationwide survey (i.e., 12 oz of beer and 1.25 oz of liquor in a shot or mixed drink).
Results: In every cup size of every task, students overestimated how much fluid they should pour to create a standard drink. In all three tasks, the magnitude of the discrepancy increased with cup size. Collapsed across cup sizes, students overpoured shots by 26%, mixed drinks by 80%, and beer by 25%. When a more liberal serving size of liquor (1.5 oz) was used as the standard, the results of the mixed drink task remained unchanged. However, the volumes poured by students during the shot free-pour task differed from the standard in only one cup size.
Conclusions: The data suggest that college students drink more alcohol than indicated by their survey responses, raising questions about the validity of widely used alcohol surveys. Efforts to educate students about the alcohol content of standard drinks should be enhanced.

Widmark, E. M. P. (1981). *Principles and applications of medicolegal alcohol determination* [Theoretischen Grundlagen und die praktische Verwendbarkeit der gerichtlich-medizinischen Alkoholbestimmung.]. Davis, Calif.: Biomedical Publications.
The first English-language translation of Widmark's seminal work written in German. His pioneering research on calculating blood alcohol concentrations in

humans, which included reliance upon understanding alcohol content in various beverages as well as alcohol content in "drinks"

Wigmore, J. G., & Elliot, D. M. (2004). Serum, blood, and breath alcohol results in a case of impaired driving causing bodily harm. *Canadian Society of Forensic Science Journal, 37*(4), 223-227.
A case report is presented in which a drinking driver who was involved in a serious single motor collision had blood samples collected at a hospital for medical purposes and later had breath samples collected and analysed by the Intoxilyzer® 5000C. The results of the serum alcohol analysis conducted by the hospital, the blood alcohol analysis conducted at the Centre of Forensic Sciences and the breath samples analysed by the Intoxilyzer® 5000C all showed close agreement. The estimated blood alcohol concentration at the time of the collision was calculated to be between 130 and 170 milligrams of alcohol in 100 millilitres of blood. The driver was convicted of impaired driving causing bodily harm and driving with a blood alcohol concentration of over 80 milligrams of alcohol in 100 millilitres of blood.

Wilkinson, P. K. (1980). Pharmacokinetics of ethanol: A review. *Alcoholism: Clinical & Experimental Research, 4*(1), 6-21.
The pharmacokinetics of ethanol in man are reviewed from a historical perspective from the earliest attempts at kinetic analysis of urinary data in 1899 to the present nonlinear analysis of blood alcohol concentration (BAC) and time data. Review of the various kinetic theories that have been utilized to describe the kinetics of alcohol metabolism is provided. Extensive review is made of recent investigations supporting the application of Michaelis-Menten enzyme kinetics to describe alcohol metabolism. Results of direct, nonlinear least-squares computer fitting of BAC following intravenous and oral feeding of alcohol both in the fasting and fed states are presented with appropriate theory. The kinetics of the oral absorption of alcohol and the relationship among stomach emptying rate, the apparent absorption rate, and the area under the BAC-time curve are discussed and data presented. The kinetics of multiple Michaelis-Menten pathways are discussed with application to the (potential) contributions of the MEOS and/or ADH systems to the observed BAC curve and resultant kinetic parameters. Several methods of obtaining pharmacokinetic (Michaelis-Menten) parameters from BAC curves and their interpretation and usage in comparative studies are presented.

William, C. K. (2005). A drink is a drink? Variation in the amount of alcohol contained in beer, wine and spirits drinks in a US methodological sample. *Alcoholism: Clinical & Experimental Research, 29*(11), 2015-2021.
Background: Empirically based estimates of the mean alcohol content of beer, wine and spirits drinks from a national sample of US drinkers are not currently available. Methods: A sample of 310 drinkers from the 2000 National Alcohol Survey were re-contacted to participate in a telephone survey with specific questions about the drinks they consume. Subjects were instructed to prepare their usual drink of each beverage at home and to measure each alcoholic beverage and other ingredients with a provided beaker. Information on the brand or type of each beverage was used to

specify the percentage of alcohol.
Resulst: The weighted mean alcohol content of respondents' drinks was 0.67 ounces overall, 0.56 ounces for beer, 0.66 ounces for wine and 0.89 ounces for spirits. Spirits and wine drink contents were particularly variable with many high-alcohol drinks observed.
Conclusions: While the 0.6-ounce of alcohol drink standard appears to be a reasonable single standard, it cannot capture the substantial variation evident in this sample and it underestimates average wine and spirits ethanol content. Direct measurement or beverage-specific mean ethanol content estimates would improve the precision of survey alcohol assessment.

Winek, C. L., Wahba, W. W., & Dowdell, J. L. (1996). Determination of absorption time of ethanol in social drinkers. *Forensic Science International, 77*(3), 169-177.
This study was designed to determine the peak, plateau and absorption times of ethanol in a social drinking setting. For the purpose of this study, subjects who had drinking times of 30 min or greater were considered to fit the 'social drinking' category.. Healthy subjects (31 male and two female) were tested immediately after they finished drinking. Blood alcohol concentrations (BAG) were measured using a breath testing instrument (Intoxilyzer& 5000). Drinking time, type and volume of alcoholic beverage consumed, subject's weight, and a brief description of the breakfast meal were recorded for each subject. The peak, plateau and absorption times were determined for each subject. Peak time was the time interval between the end of drinking and the maximum blood alcohol measurement. Plateau time was the time interval between peak time and the end of absorption time, i.e. the interval between peak time and the beginning of dissipation. Absorption time was defined as the peak time plus plateau time. Among 31 subjects with drinking times of 30 min or greater, 23 (74.2%) had peak and absorption times of < 30 and < 60 min, respectively. Twenty four out of 31 (77.4%) social drinkers had an absorption time of < 60 min, regardless of their peak time. Overall, the average peak and absorption times were 17.4 f 17.3 (range O-74) and 42.2 f 31.5 (range l-130) min. Plateau times averaged 24.9 i 23.1 with a range of O-74 min. It can be concluded from this study that in a social drinking setting, a shorter time to peak and faster rate of absorption may occur when ethanol is consumed over an extended period of time. This is in contrast to results reported in earlier studies involving bolus drinking where longer absorption times occurred.

Zandy, S. L., Pang, J. S., Ho, M. R., & Matthews, D. B. (2013). Singaporean college students overpour drinks similar to western populations: Influence of peer presence in a simulated Alcohol - Pouring task. *Alcoholism: Clinical and Experimental Research*, forthcoming.
Background: College drinking is a global health concern. However, most studies originate from countries with high alcohol consumption. In the United States, college students overpour a standard alcoholic drink, yet it is unclear if this remains true in countries with low alcohol consumption. Additionally, in college, peer influence is the greatest predictor of drinking behavior, yet it is unknown if social norms affect how students pour drinks. This study examined how male college

students, in a country with low alcohol consumption, define standard drinks, and if the presence of an unfamiliar peer affects how students pour during a simulated alcohol-pouring task.
Methods: Male undergraduate students (n = 105) underwent baseline assessments of impulsivity, self-monitoring, religiosity, and drinking characteristics. Participants poured fluid into empty cups of different sizes to equal a standard serving of beer or shot of liquor. There were 2 groups based on gender of experimenter. Within each group, participants were randomly assigned to Alone or Dyad condition. In the Alone condition, students were instructed to pour only for themselves. In the Dyad condition, students were instructed to pour for themselves and the experimenter. The volumes poured by the students were compared with standards used in Singapore and the United States.
Results: Collapsed across container size, students overpoured shots by 50% and beer by 100% when compared to the standard drink definition in Singapore. When using a more liberal definition, students overpoured beer by 25%, but did not overpour shots. In the presence of an unfamiliar peer, overpouring decreased by 10% for beer.
Conclusions: The current data show that college students, in a country with low alcohol consumption, overestimate standard alcoholic drinks similar to their Western counterparts and use social norms to determine how much to pour for a drink when confronted with an unfamiliar peer. Efforts toward creating internationally recognized standard drink definitions should be considered.